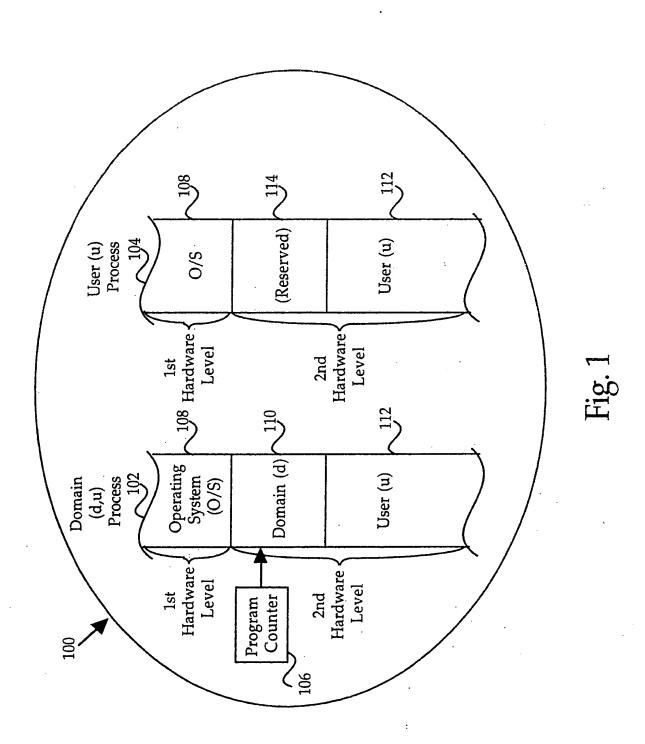Fig. 1
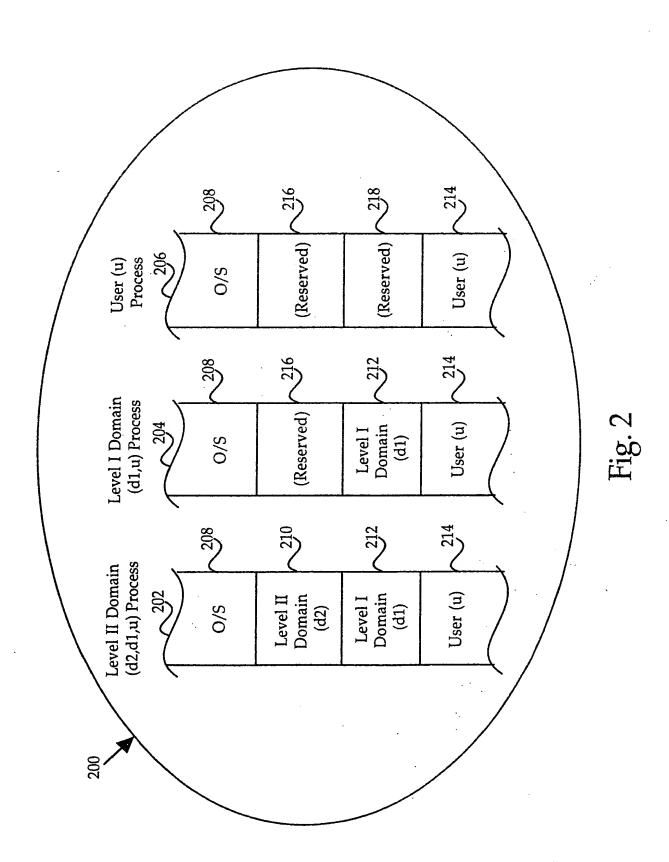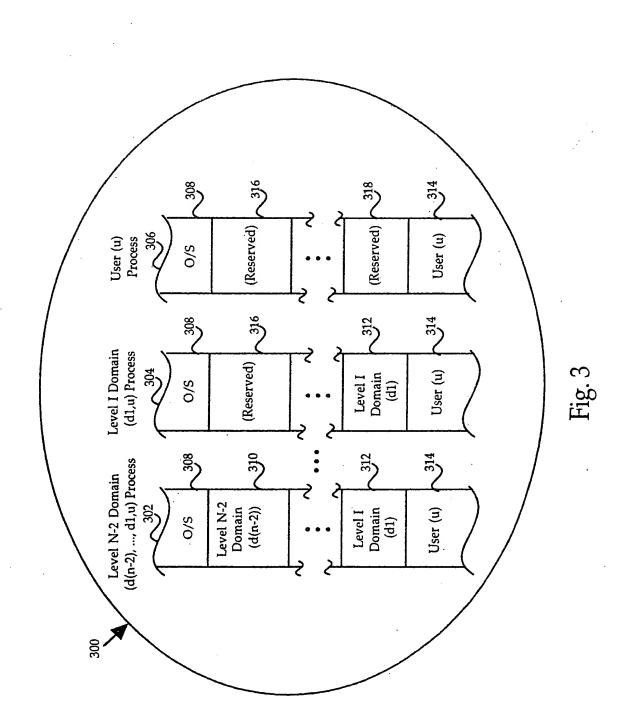
Fig. 2

Applicant: Rajeev Bharadhwaj
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Fig. 3

400

| Call Gate: |
|:---:|
| First Target Code-Segment |
| Second Target Code-Segment |
| . . . |
| kth Target Code-Segment |

402

404

406

Fig. 4

```
              ┌──────────────────┐
              │      Start        │
              │  Process  Pair    │
              └──────────────────┘
                       │
                       ▼
┌──────────────────────────────────────────────┐   502
│ Receive request from Calling-Code in a Calling-Code │
│      Process to connect to a Target           │
└──────────────────────────────────────────────┘
                       │
                       ▼
┌──────────────────────────────────────────────┐   504
│  Generate, from a template, a Call Gate containing a │
└──────────────────────────────────────────────┘
                       │
                       ▼
┌──────────────────────────────────────────────┐   506
│   Insert the Call Gate and the Target Code-Segment │
└──────────────────────────────────────────────┘
                       │
                       ▼
┌──────────────────────────────────────────────┐   508
│ Create a Target Process for the Target, if the Target │
│      Process is not already in existence       │
└──────────────────────────────────────────────┘
                       │
                       ▼
┌──────────────────────────────────────────────┐   510
│ Intra-Pair Context switch from the Calling-Code │
│         Process to the Target Process          │
└──────────────────────────────────────────────┘
                       │
                       ▼
┌──────────────────────────────────────────────┐   512
│  Generate, from a template, another Call Gate  │
│    containing another Target Code-Segment      │
└──────────────────────────────────────────────┘
                       │
                       ▼
┌──────────────────────────────────────────────┐   514
│  Insert the Call Gate and the Target Code-Segment │
│             into the Target                    │
└──────────────────────────────────────────────┘
                       │
                       ▼
              ┌──────────────────┐
              │       End         │
              └──────────────────┘
```

Fig. 5

600

| Target Code-Segment: |
| --- |
| Target Code-Segment Address |
| Interface Definition Language Description of Arguments (for Remote Calls) |
| Linking-Code |
| Calling-Code Return State |

602

604

606

608

## Fig. 6

700

| Target Code-Segment Parameters: |
| --- |
| Target Code-Segment Identifier |
| Arguments |

702

704

## Fig. 7

Fig. 8

```
              ┌──────────────┐
              │  Start User to │
              │    Domain      │
              │    Control     │
              └──────────────┘
                      │
                      ▼
┌──────────────────────────────────────────────────────┐   902
│ Execute User Code in a User Process calling for execution of targeted │
│           Domain Code in a Domain Process              │
└──────────────────────────────────────────────────────┘
                      │
                      ▼
┌──────────────────────────────────────────────────────┐   904
│ Branch to a Call Gate Target Code-Segment in the User code │
│        corresponding to the targeted Domain Code       │
└──────────────────────────────────────────────────────┘
                      │
                      ▼
┌──────────────────────────────────────────────────────┐   906
│ Execute Linking-Code in the Target Code-Segment and enter │
│     Operating System (O/S) Code in the User Process    │
└──────────────────────────────────────────────────────┘
                      │
                      ▼
┌──────────────────────────────────────────────────────┐   908
│ Intra-Group Context switch from the User Process to the Domain │
│                       Process                          │
└──────────────────────────────────────────────────────┘
                      │
                      ▼
┌──────────────────────────────────────────────────────┐   910
│ Enter a Call Gate Target Code-Segment in the Domain code │
│         corresponding to the User Code                 │
└──────────────────────────────────────────────────────┘
                      │
                      ▼
┌──────────────────────────────────────────────────────┐   912
│          Branch to the targeted Domain Code            │
└──────────────────────────────────────────────────────┘
                      │
                      ▼
┌──────────────────────────────────────────────────────┐   914
│          Execute the targeted Domain Code             │
└──────────────────────────────────────────────────────┘
                      │
                      ▼
┌──────────────────────────────────────────────────────┐   916
│      Execute User to Domain Code Access Return code    │
└──────────────────────────────────────────────────────┘
                      │
                      ▼
                 ┌─────────┐
                 │   End    │
                 └─────────┘
```
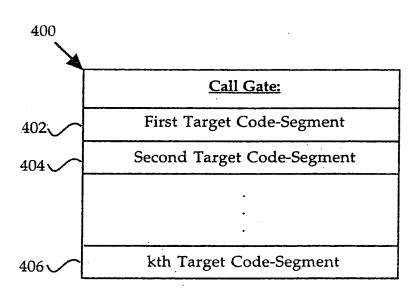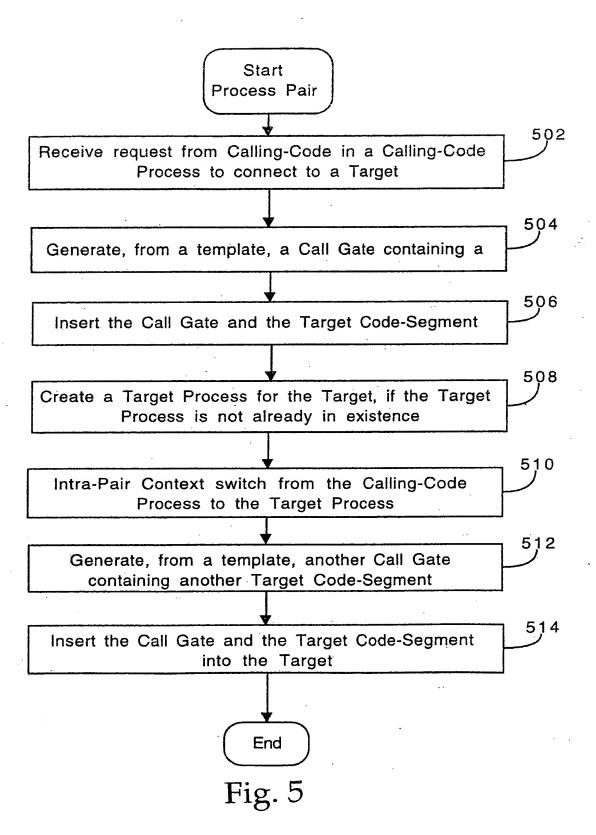
# Fig. 9

Fig. 10

Applicant: Rajeev Bharadhwaj
Filing Date: April 11, 1997
Title: System And Method For Multi-Level Memory Domain
Protection
Application No.: 08/834,060
Reference No.: PA554US
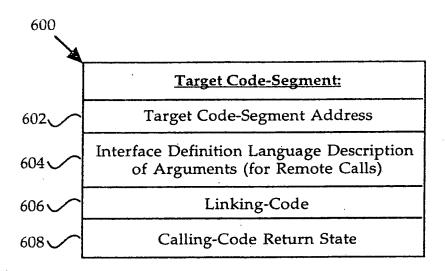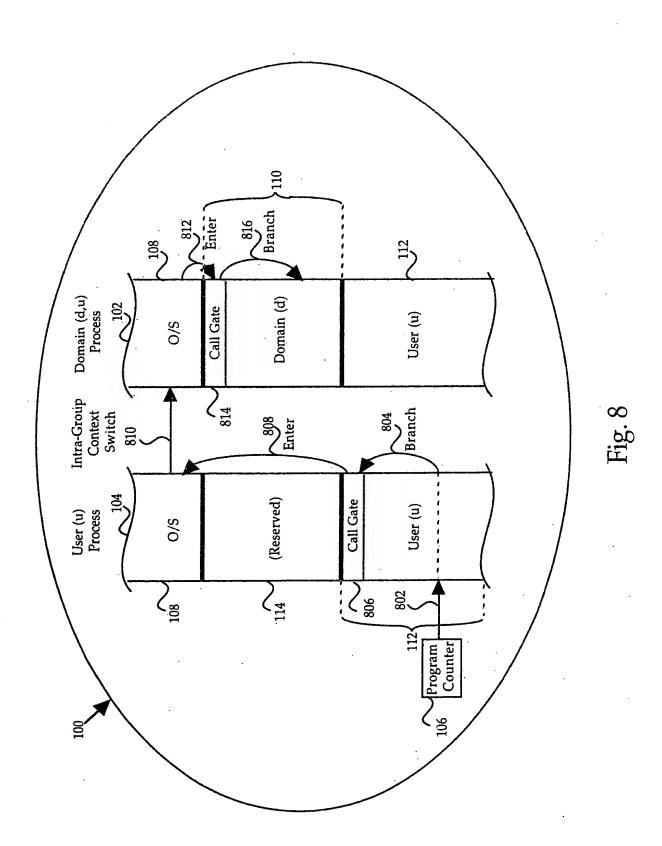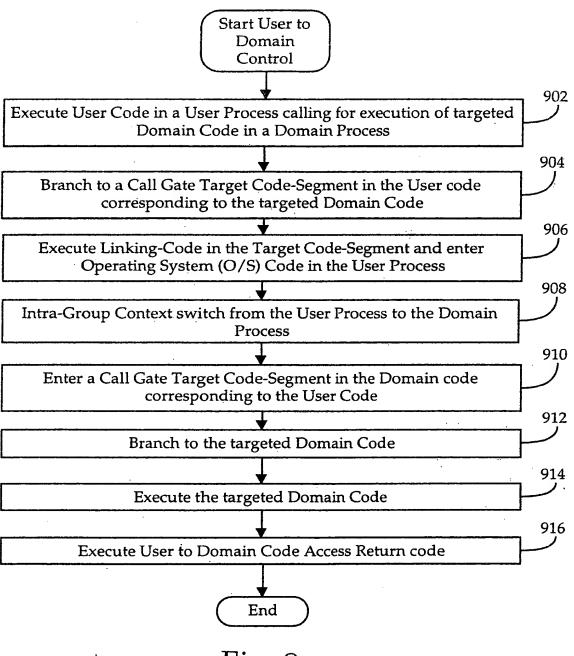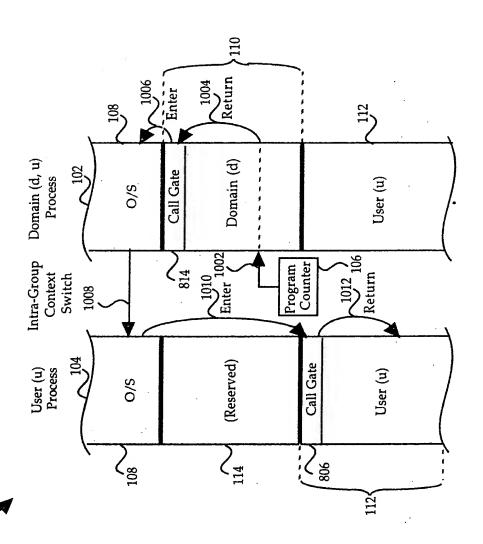Sheet: 10 of 18          Batch No.: K47

```
                        ┌─────────────────┐
                        │  Start User to  │
                        │     Domain      │
                        │     Control     │
                        └─────────────────┘
                                 │
                                 ▼
┌────────────────────────────────────────────────────────┐    1102
│ Execute Domain Code in a Domain Process calling for      │
│ return to calling User code in a User Process            │
└────────────────────────────────────────────────────────┘
                                 │
                                 ▼
┌────────────────────────────────────────────────────────┐    1104
│ Return to a Call Gate Target Code-Segment in the Domain  │
│ Code corresponding to the calling User Code              │
└────────────────────────────────────────────────────────┘
                                 │
                                 ▼
┌────────────────────────────────────────────────────────┐    1106
│ Execute Linking-Code in the Target Code-Segment and      │
│ enter O/S Code in the Domain Process                     │
└────────────────────────────────────────────────────────┘
                                 │
                                 ▼
┌────────────────────────────────────────────────────────┐    1108
│ Intra-Group Context switch from the Domain Process to    │
│ the User Process                                         │
└────────────────────────────────────────────────────────┘
                                 │
                                 ▼
┌────────────────────────────────────────────────────────┐    1110
│ Enter a Call Gate Target Code-Segment in the User Code   │
│ corresponding to the Domain Code                         │
└────────────────────────────────────────────────────────┘
                                 │
                                 ▼
┌────────────────────────────────────────────────────────┐    1112
│ Execute Linking-Code in the Target Code-Segment to       │
│ place the calling User Code in a Return State            │
└────────────────────────────────────────────────────────┘
                                 │
                                 ▼
┌────────────────────────────────────────────────────────┐    1114
│ Return to the calling User code                          │
└────────────────────────────────────────────────────────┘
                                 │
                                 ▼
┌────────────────────────────────────────────────────────┐    1116
│ Resume executing the calling User Code                   │
└────────────────────────────────────────────────────────┘
                                 │
                                 ▼
                           ┌───────────┐
                           │    End    │
                           └───────────┘
```

# Fig. 11

Fig. 12

```
                    ╭──────────────╮
                    │ Start Domain │
                    │   to User    │
                    │   Control    │
                    ╰──────────────╯
                            │
                            ▼
┌────────────────────────────────────────────────────────┐     1302
│  Execute Domain Code in a Domain Process calling for     │
│  execution of targeted User Code in a User Process       │
└────────────────────────────────────────────────────────┘
                            │
                            ▼
┌────────────────────────────────────────────────────────┐     1304
│  Branch to a Call Gate Target Code-Segment in the        │
│  Domain code corresponding to the targeted User Code     │
└────────────────────────────────────────────────────────┘
                            │
                            ▼
┌────────────────────────────────────────────────────────┐     1306
│  Execute Linking-Code in the Target Code-Segment and     │
│  enter O/S Code in the Domain Process                     │
└────────────────────────────────────────────────────────┘
                            │
                            ▼
┌────────────────────────────────────────────────────────┐     1308
│  Intra-Group Context switch from the Domain Process to   │
│  the User Process                                        │
└────────────────────────────────────────────────────────┘
                            │
                            ▼
┌────────────────────────────────────────────────────────┐     1310
│  Enter a Call Gate Target Code-Segment in the User code  │
│  corresponding to the Domain Code                        │
└────────────────────────────────────────────────────────┘
                            │
                            ▼
┌────────────────────────────────────────────────────────┐     1312
│  Branch to the targeted User Code                        │
└────────────────────────────────────────────────────────┘
                            │
                            ▼
┌────────────────────────────────────────────────────────┐     1314
│  Execute the targeted User Code                          │
└────────────────────────────────────────────────────────┘
                            │
                            ▼
┌────────────────────────────────────────────────────────┐     1316
│  Execute Domain to User Control Transfer Return code     │
└────────────────────────────────────────────────────────┘
                            │
                            ▼
                    ╭──────────────╮
                    │     End      │
                    ╰──────────────╯
```

Fig. 13

100

Domain (d, u)        Intra-Group       User (u)
  Process             Context           Process
                      Switch
      102             1408                  104

108          O/S                   O/S              108

                      1410
        Call Gate             Enter
814

                      1412
110     Domain (d)          Branch     (Reserved)          1406
                                                           Enter

                              114

                                         Call Gate
                      806
                                                           1404
              1402                                         Return
112     User (u)    112      User (u)

                    Program
                    Counter

                      106

Fig. 14

Start Domain to
User Control
Transfer Return

Execute User Code in a User Process calling for return to calling
Domain code in a Domain Process                                    1502

Return to a Call Gate Target Code-Segment in the User Code
corresponding to the calling Domain Code                           1504

Execute Linking-Code in the Target Code-Segment and enter O/S
Code in the User Process                                           1506

Intra-Group Context switch from the User Process to the Domain
Process                                                            1508

Enter a Call Gate Target Code-Segment in the                      1510

Execute Gate Code in the Target Code-Segment to place the
calling Domain Code in a Return State                              1512

Return to the calling Domain code                                  1514

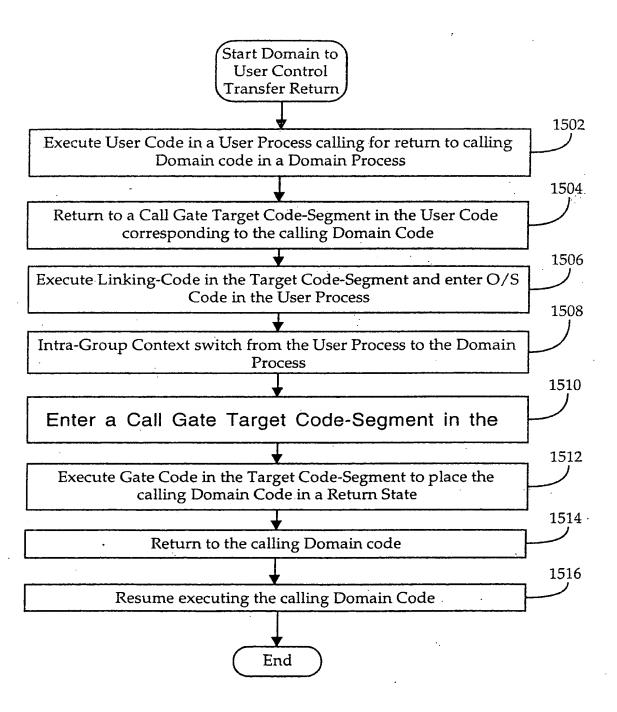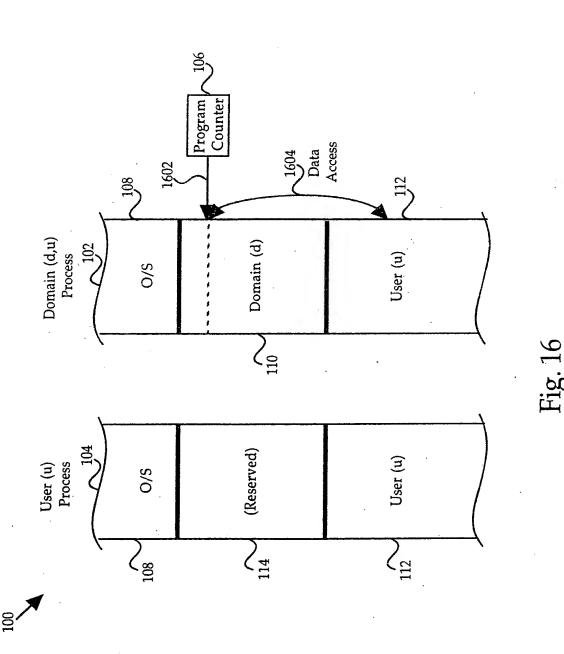Resume executing the calling Domain Code                           1516

End

Fig. 15

Applicant: Rajeev Bharadhwaj
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Fig. 16

Start Domain to
User Data
Access

Execute Domain Code, in a Domain Process calling for a data
access from targeted User Code
— 1702

Access the data located in the targeted User Code
— 1704

Resume execution of the Domain Code
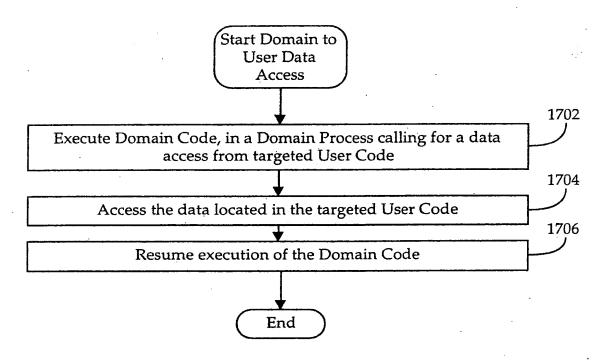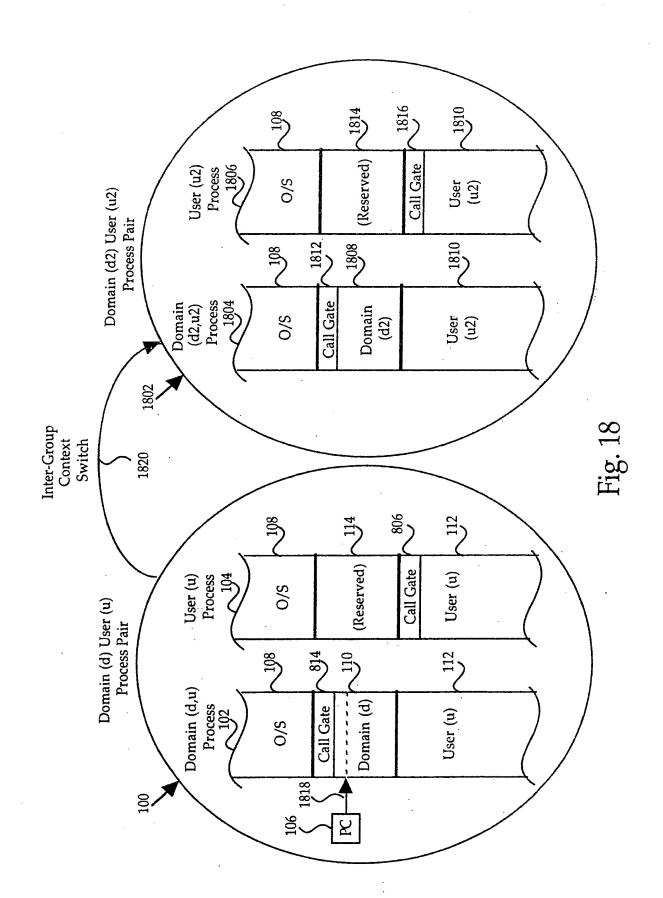— 1706

End

# Fig. 17

Applicant: Rajeev Bharadhwaj
Filing Date: April 11, 1997
Title: System And Method For Multi-Level Memory Domain
        Protection
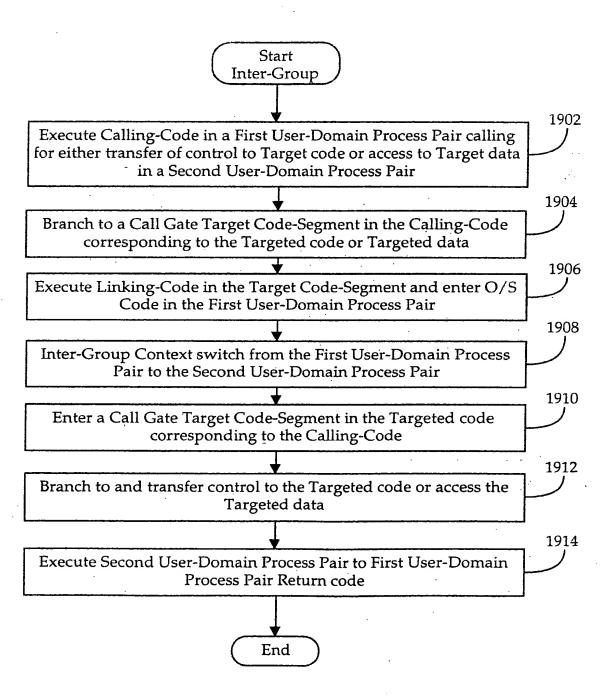Application No.: 08/834,060
Reference No.: PA554US
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Fig. 18

```
                    ┌─────────────────┐
                    │      Start       │
                    │   Inter-Group    │
                    └─────────────────┘
                             │
                             ▼
   ┌─────────────────────────────────────────────────────────┐  1902
   │ Execute Calling-Code in a First User-Domain Process Pair │
   │ calling for either transfer of control to Target code or │
   │ access to Target data in a Second User-Domain Process    │
   │ Pair                                                      │
   └─────────────────────────────────────────────────────────┘
                             │
                             ▼
   ┌─────────────────────────────────────────────────────────┐  1904
   │ Branch to a Call Gate Target Code-Segment in the Calling-│
   │ Code corresponding to the Targeted code or Targeted data │
   └─────────────────────────────────────────────────────────┘
                             │
                             ▼
   ┌─────────────────────────────────────────────────────────┐  1906
   │ Execute Linking-Code in the Target Code-Segment and      │
   │ enter O/S Code in the First User-Domain Process Pair     │
   └─────────────────────────────────────────────────────────┘
                             │
                             ▼
   ┌─────────────────────────────────────────────────────────┐  1908
   │ Inter-Group Context switch from the First User-Domain     │
   │ Process Pair to the Second User-Domain Process Pair      │
   └─────────────────────────────────────────────────────────┘
                             │
                             ▼
   ┌─────────────────────────────────────────────────────────┐  1910
   │ Enter a Call Gate Target Code-Segment in the Targeted    │
   │ code corresponding to the Calling-Code                   │
   └─────────────────────────────────────────────────────────┘
                             │
                             ▼
   ┌─────────────────────────────────────────────────────────┐  1912
   │ Branch to and transfer control to the Targeted code or   │
   │ access the Targeted data                                 │
   └─────────────────────────────────────────────────────────┘
                             │
                             ▼
   ┌─────────────────────────────────────────────────────────┐  1914
   │ Execute Second User-Domain Process Pair to First User-    │
   │ Domain Process Pair Return code                          │
   └─────────────────────────────────────────────────────────┘
                             │
                             ▼
                    ┌─────────────────┐
                    │       End        │
                    └─────────────────┘
```

Fig. 19